



# Project Summary

US Army Engineer  
Research and Development Center  
Waterways Experiment Station

August 2002

---

Public Affairs Office Ž 3909 Halls Ferry Road Ž Vicksburg, MS 39180-6199 Ž (601) 634-2504 Ž <http://www.wes.army.mil>

## Application of Trenchless Technologies for Civil Works Structures

**Principal Investigators:** [Lillian D. Wakeley](#), (CEERD-GS-G), 601-634-3215.

**Problem Statement:** Trenchless construction methods have the capability to solve construction and maintenance challenges with COE structures. Standards and methods for evaluating and permitting trenchless technology are unavailable to Corps personnel. Projects could be completed faster, more economically, and more safely with guidance criteria. The Corps must have the applications and expertise necessary to establish quality control criteria. The Corps must also have rational, independently developed criteria and guidelines for regulating where and how the technologies can be applied.



**Objectives:** Provide the Corps Districts with proven information for the safe and economic use of trenchless technology for critical construction and new construction, maintenance applications, and rehabilitation applications, including microtunneling, directional drilling, pipe bursting, pipe ramming, piercing tool technology, and cured-in place liners on USACE projects.

**Scope:** Research will be conducted in part by partnering with established organizations that have trenchless technology expertise to develop cost and productivity data and to determine the limitations of new technologies. The American Society of Civil Engineers (ASCE), the National Utility Contractors Association (NUCA), the North American Society for Trenchless Technologies (NASTT) and the American Society for Testing Materials (ASTM) are actively developing guidelines and standards for applications of trenchless technology. These resources will be used in the development of Corps Districts applications guidance. Case history analyses will be most useful in identifying potential problems, limitations, and solutions. Networking with potential Corps users has refined identified needs. Initial efforts focused on those high priority needs already identified, including the installation of pipelines beneath levees; seepage remediation measures, including cutoff and collection; foundation stabilization; and replacement or rehabilitation of culverts. The research results will provide the Corps Districts with proven information for the safe and economic use of trenchless technologies for critical construction applications.

**Approach:** 1) Assess status of standards development efforts, 2) Gather information from corps personnel to focus efforts on critical needs, 3) Conduct corps survey to further refine the application guidance needs, and 4) Develop specific guidance keyed to most urgent Corps Districts need.

**Results:** Monitored Development on Application Guidance (NASTT, NUCA, ASCE, ASTM). Work completed in FY99 identified critical gaps and develop specific application guidance for trenchless technology. Identification of needs for user guidance in trenchless technology applications” (Trenchless Technology Center (TTC), 7/98). Developed guidance on microtunneling jacking forces and ground deformation (9/98). Sent questionnaires to municipal forum groups on trenchless methods used and guidance needs (3/99). Participated in standards groups and committees to develop applications guidance (ASCE MT construction guidelines). Prepared “Guidelines for Pipe Bursting” (TTC, 4/99). Developed guidelines for Pipe Ramming, 70% completed. Developed guidelines for Impact Moling, 20% completed. District Personnel were contacted and their experience with Trenchless Technologies was assessed; also, their limitations and deficiencies with regards to application direction were identified. Corps Districts predominant trenchless experience was directional drilling. Papers and reports concerning Directional drilling beneath levees, Retrievable microtunneling, and Prediction of microtunneling jacking forces were prepared.



**Trenchless Applications:** 1) Culverts & Drains, 2) Levee / River Crossings, 3) Seepage Collection / Cutoff, 4) Instrumentation / Monitoring / Inspection, 5) Lake Taps / Water Supply, and 6) Wetlands Restoration.

**Intended user of product(s):** The products would be used by Corps Districts and pipeline and construction industries.



**Capability provided to user:** Improvement in current practice or new capability (value added). The capabilities to be provided to the user are new applications guidance where none currently exists, and the enhanced ability to specify and safely use trenchless methods on Corps Districts projects.

**Benefits:** Trenchless technology, including microtunneling, directional drilling, pipe bursting and pipe ramming, offer the capability for renewal and rehabilitation of underground infrastructure with far less disruption to traffic, business, and other surface activities compared to open cut construction. Worker and public safety is greatly enhanced, as open trench construction leads all other categories for construction related accidents and fatalities. Trenchless technology reduces the risk of damage to nearby structures and utilities, including levees, embankments, and gas, water, sewer, and telecommunications pipelines. In some cases, trenchless technology offers the only viable means of

completing a project. Applications guidelines allow district users to: 1) Understand applications and limitations of technology: a) Effectively deal with permitting issues and b) reject applications for permits if technical basis / submittals are inadequate or not sound; 2) Recognize potential applications for solutions to specific problems, 3) Confidently specify trenchless alternatives: a) Significant cost savings, b) reliability, and c) enhanced safety; 4) have trenchless technology solutions and application guidance available: a) Construction, b) maintenance, and c) rehabilitation; 5) take advantage of significant economic and safety advantages over open-cut or other disruptive technologies.

**Conclusion:** Critical deficiencies have been identified and existing standards collected. Standards development efforts were assessed and products evaluated for application potential on Corps projects. Private industry can and does provide the construction technology capability. However, private industry cannot and does not provide guidance for Corps applications. In addition, the Corps must have the applications and expertise necessary to establish quality control criteria. The Corps must also have rational, independently developed criteria and guidelines for regulating where and how the technologies can be applied. The impact on the Corps if the application of Trenchless Technologies for Civil Works Structures is not approved is that the use of trenchless technology as a non-disruptive alternative to open-cut construction would not be permitted on Corps projects and structures. In some cases, the project could not be built using other construction methods.

This project is part of the Geotechnical Engineering Research Program. Contact Lillian Wakeley ([wakelel@wes.army.mil](mailto:wakelel@wes.army.mil)) or Mike Klosterman ([michaeljklosterman@hq02.usace.army.mil](mailto:michaeljklosterman@hq02.usace.army.mil)) for program information.